THE METHOD OF MATHEMATICAL MODEL PLOTTING OF SYSTEM FUNCTIONAL RELIABILITY

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The designed pipe-line systems possess sufficient reliability and do not cause much anxiety, concerning possible unforeseen faults of the transport system in target product supply to a consumer. The comparative analysis of the network pattern influence on the system functional reliability bases itself upon statistics and analytic method use, that is stated in reference [4]. However in a number of cases the network pattern use of the given method does not seem possible because of uncommon transfer of ZBR graph to the calculation model of functional reliability. Namely for these purposes the modification of statistics and analytic method of functional reliability calculation of the system on the basis of Poisson inputs failure conception use is suggested. As it is well-known, one of the peculiarities of Poisson inputs failure is the statement, that two or more inputs can not occur in a system. The given statement is a prerequisite of the new modified method of ZBR.

The modified method of ZBR includes all the stages of mathematical model plotting of functional system reliability, typical to the method of ZBR. The modified method of ZBR presupposes carrying out of the first four stages of ZBR method without any changes or additions. The modified method of ZBR consists of the cardinal changes of the 5th and 7th stages. Let us enlist these stages: 5) Functional reliability calculation model plotting of the main network considering particular consumers; 7) Mathematical model making of the network functional reliability with the help of classical methods of reliability calculation of engineering systems.

At the $5^{\underline{th}}$ stage hypotheses, that make up a full group of incompatible events, are suggested. A number of hypotheses should be one more than a number of zones of breakdown and repair, considering pipelines of non-zero length. The hypothesis H_i (where i=1,2,…,k-1) presupposes, that a failure in a pipeline ZBR №i occurred in the system, and the system H_k is operating failure-free. Other hypotheses are not considered, as under the condition of Poisson inputs, more than one failure in a system does not simultaneously occur. Later on the probabilities of suggested hypotheses $P(H_i)$ where (i=1,2,…,k), and k is a general quantity of hypotheses, are being determined.

At the final stage of a modified method on the basis of the theorem "of the full probability " statement (1) a desired mathematical model of the system functional reliability is constructed (being independent from the type of a coffer-dam) as follows:

$$P_{2+\text{п}}^{f*} = P(A) = \sum_{i=1}^{k} P(H_i)\, P(A/H_i). \qquad (1)$$

Here, the upper index "star" denotes, that the mathematical model of functional reliability has been got on the basis of Poisson inputs failure conception.

The outcomes, received with the help of modified method of fully conforms the statistic data of observations for the ZBR behavior of the operating systems and are proved with the calculation experiments. The suggested method does not contradict to the famous method of ZBR, but is more universal, as it allows to make calculations for bridge structures.

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